The Use of Recycled Tire Materials on Playgrounds & Synthetic Turf Fields
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Background
Ground rubber — also called "tire crumb" or "crumb rubber" — is recovered from scrap tires or from the tire retreading process. It is used in road construction and in a number of athletic and recreational applications, including ground cover under playground equipment, running track material, and as a soil additive on sports and playing fields.

Crumb rubber is often used in synthetic turf fields as "infill" between turf fibers to provide stability, uniformity and resiliency to synthetic turf fields. Synthetic turf was developed in the mid-1960s and has since gained widespread popularity around the country. Synthetic turf was originally used in stadiums and on athletic fields for college and professional sports teams, but now is also used in municipal parks, golf courses, playgrounds, cruise ships, and airports. There is also a growing residential market.

According to the Synthetic Turf Council, synthetic turf has been installed in approximately 4,500 U.S. fields, tracks and playgrounds.

Public Concerns
Over the past several years, a number of public concerns have been raised over the use of tire crumb materials in turf fields and playgrounds. For example, parents in Colorado were concerned about children carrying home small particles of tire crumbs on their clothing. About this time, high levels of lead were detected on some synthetic turf fields in New Jersey.

EPA Research
In response to these concerns, the EPA developed an agency workgroup that initiated a limited-scale scoping study to test a study protocol and monitoring methods for generating environmental data associated with the use of recycled tire material on synthetic turf fields and playgrounds.

As part of this evaluation, data were collected at a limited number of sites. The full study protocol was implemented at two synthetic turf fields and one playground. Additional samples were collected at four other synthetic turf fields and a second playground. Sampling sites were located in North Carolina, Georgia, Ohio, and Maryland.

It is important to have accurate and reproducible methods for measuring environmental concentrations of the components of synthetic turf fields and playgrounds. The study protocols and the majority of the methods evaluated were found to be appropriate for characterizing concentrations of tire crumb components in the environment.

Given the very limited nature of this study (i.e., limited number of components monitored, samples sites, and samples taken at each site) and the wide diversity of tire crumb material, it is not possible to extend the results beyond the four study sites or to

reach any more comprehensive conclusions without the consideration of additional data.

Both the Consumer Product Safety Commission and the Centers for Disease Control and Prevention recommend that young children wash their hands frequently after playing outside and always before they eat. The EPA also recommends these practices.

Key Technical Findings from the EPA's Study

The key study findings are summarized below. In general, the study protocol is expected to reliably yield data for assessing environmental concentrations of selected tire crumb constituents and understanding potential routes of exposure.

1. The study protocol and many of the methods were found to be reliable and could be implemented in the field. Several limitations are noted as follows.
    - Collecting integrated air samples provided a high burden in terms of time and equipment.
    - Semivolatile organic compounds (SVOCs) were not measured.
    - At any single site, there can be substantial variability in the tire crumb materials used and the concentrations of contaminants measured. More work is needed to determine where to collect samples and how many samples to collect to fully characterize a given site.
    - It was difficult to obtain access and permission to sample at playgrounds and recreational fields. More work is needed to increase public and private owner participation if these studies are to be implemented.
2. Methods used to measure air concentrations of particulate matter (PM) and metals were found to be reliable.
3. Methods used to measure volatile organic compounds (VOCs) in air were found to be reliable.
4. Methods used to measure extractable metals from turf field blades, tire crumb materials, and turf field wipe samples were found to be reliable. However, the aggressive acid extraction procedure likely will overestimate the concentration of metals that are readily available for human uptake. Because understanding human uptake or absorption is a key component in understanding risk, methods to determine bioavailable metal concentrations are still needed.
5. Given the limited nature of the study (limited number of constituents monitored, sample sites, and samples taken at each site) and the wide diversity of tire crumb material, it is not possible, without additional data, to extend the results beyond the four study sites to reach more comprehensive conclusions.

When considering future study designs and implementation, the research needs to carefully consider issues associated with identifying and gaining site access, and benefits of obtaining the data versus the resource burden, and the implementation of other methods for generating data to address specific research hypotheses. Future

studies will need a carefully developed and implemented communications plan to promote the value of the research and gain access to the required facilities.

Additional information on recycled tire materials
After a review of the literature, the EPA identified a number of compounds or materials that may be found in tires, although not all are contained in every tire:

- acetone
- aniline
- arsenic
- barium
- benzene
- benzothiazole
- cadmium
- chloroethane
- chromium
- cobalt
- copper
- halogenated flame retardants
- isoprene
- latex
- lead
- manganese
- mercury
- methyl ethyl ketone
- methyl isobutyl ketone
- naphthalene
- nickel
- nylon
- phenol
- pigments
- polycyclic aromatic hydrocarbons
- polyester
- rayon
- styrene - butadiene
- toluene
- trichloroethylene